

(12) **UK Patent Application** (19) **GB** (11) **2 238 438 A** (13)
 (43) Date of A publication 29.05.1991

(21) Application No 9024913.7

(22) Date of filing 16.11.1990

(30) Priority data
 (31) 01299650 (32) 20.11.1989 (33) JP

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(51) INT CL^a
G04G 7/02

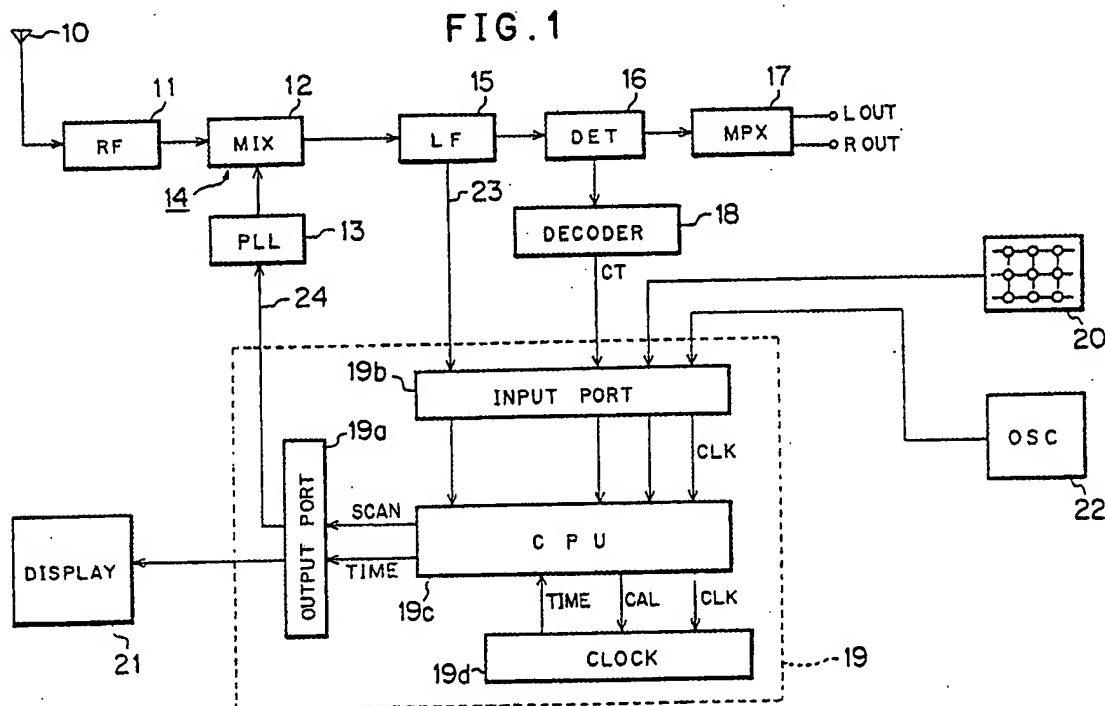
(52) UK CL (Edition K)
H3Q QCD Q101 Q103 Q200 Q6F
U1S S2199

(56) Documents cited
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(58) Field of search
UK CL (Edition K) G3T, H3Q QCD
INT CL^a G04G 7/02, H03J 5/00

(54) **Radio data system receiver with clock time function**

(57) An RDS receiver which is capable of detecting a clock time (CT) signal searches for a transmission bearing such a signal when either such a transmission has just been lost or the user requests such a search. The frequency of a transmission containing a CT signal may be stored.



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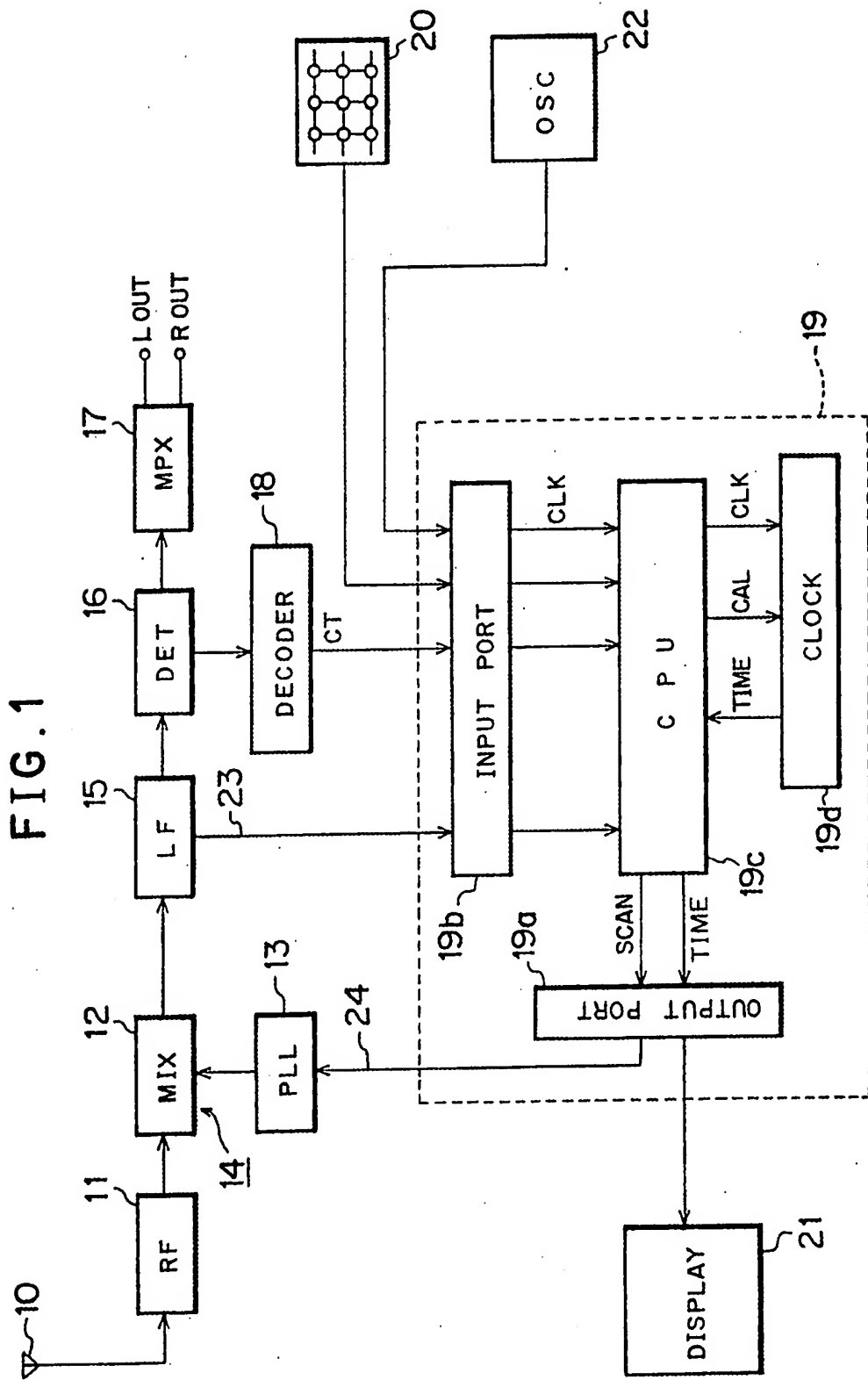


FIG. 2

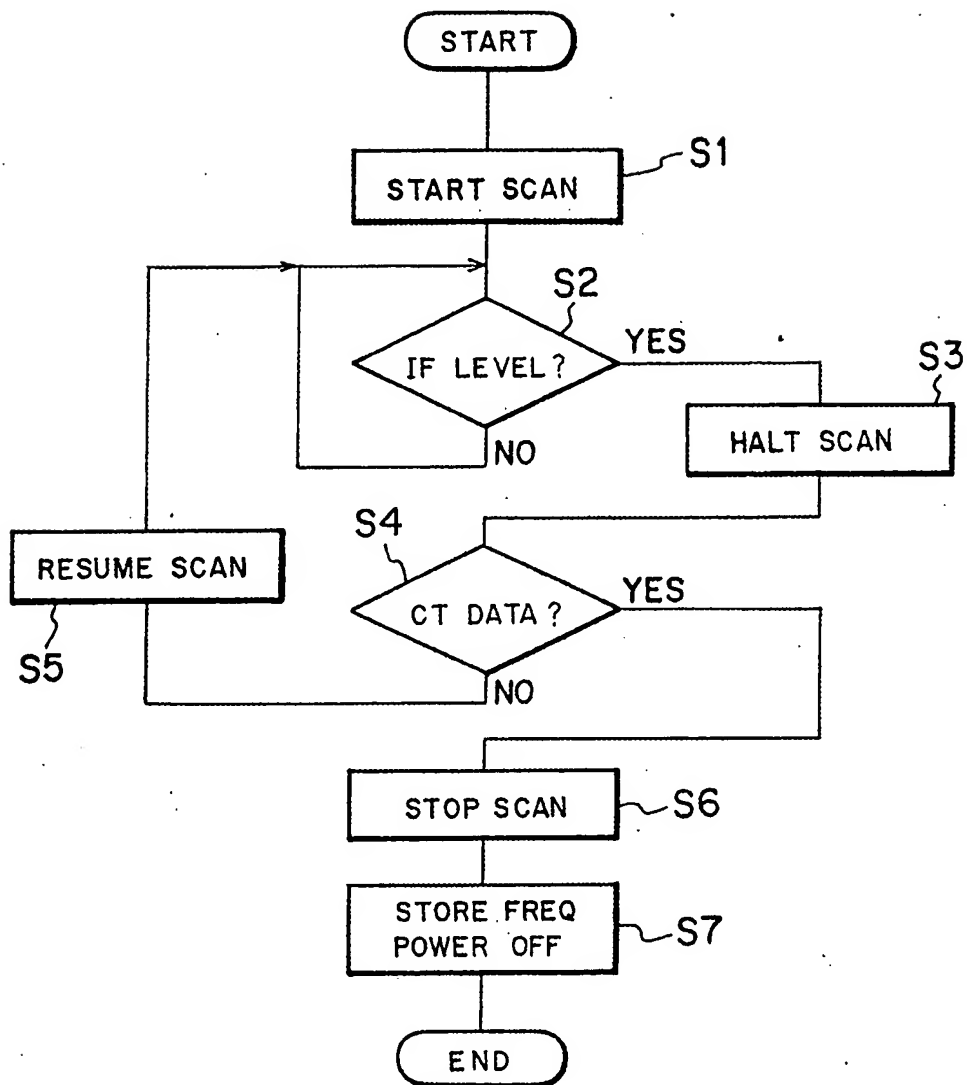


FIG. 3

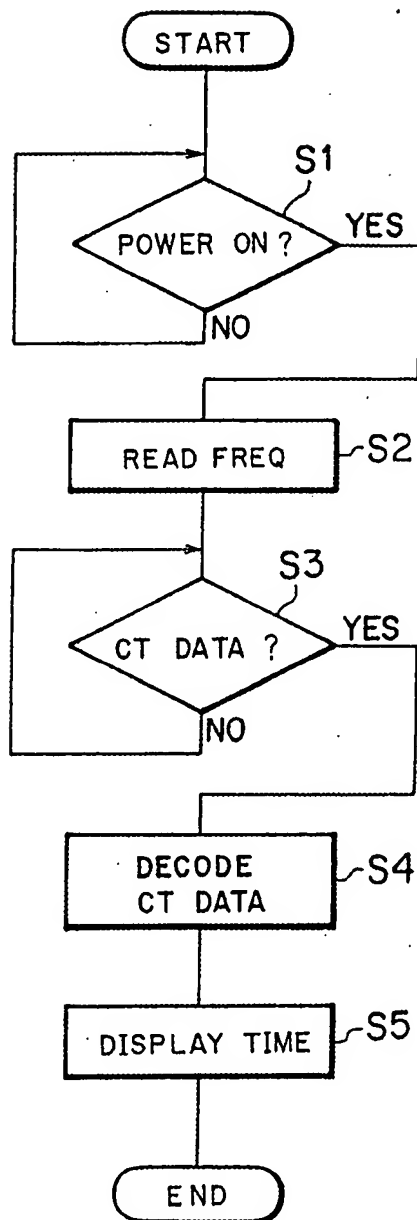


FIG. 4

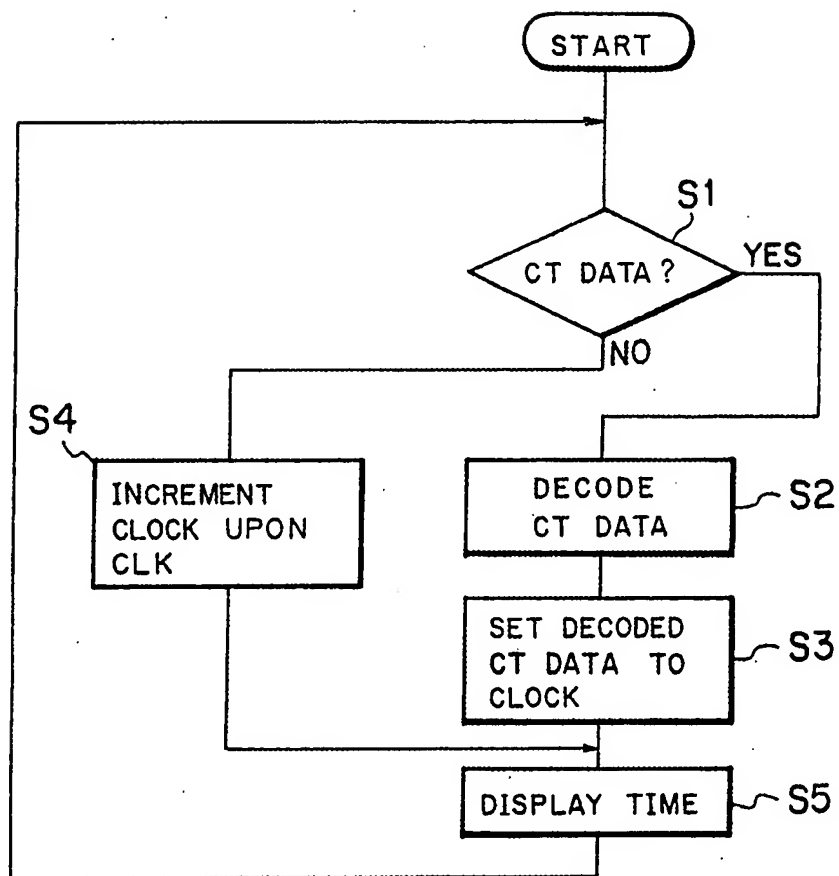


FIG. 5

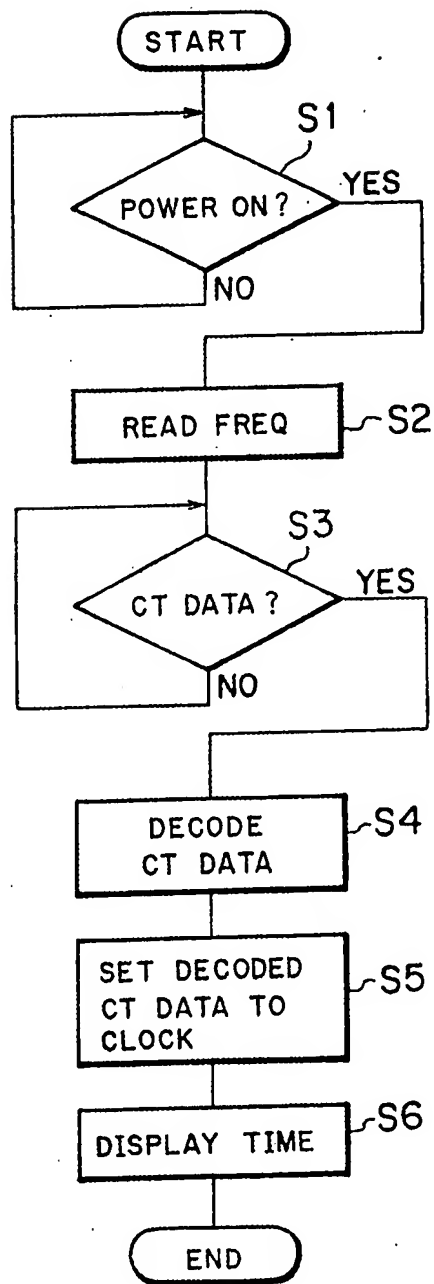


FIG. 6

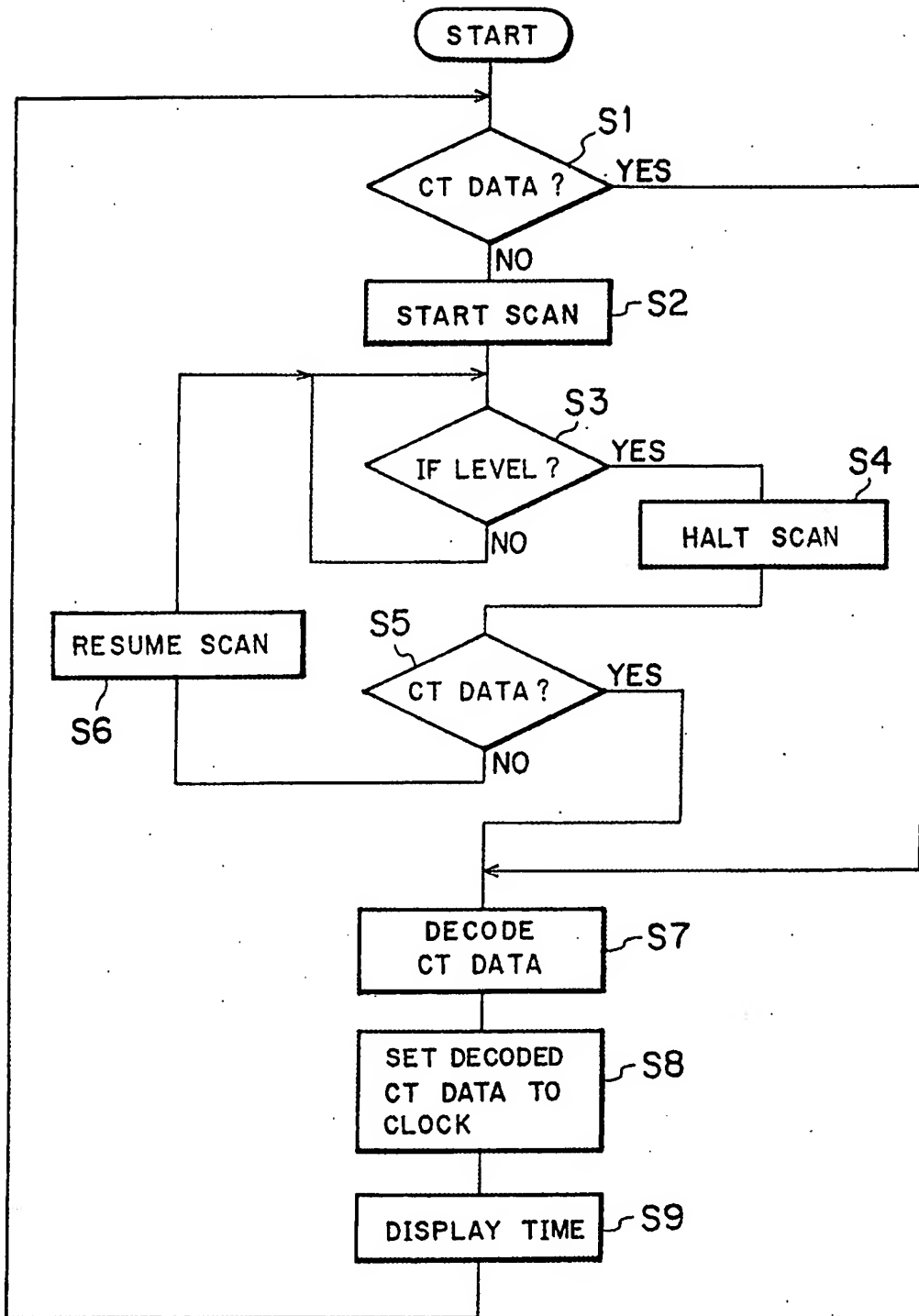


FIG. 7

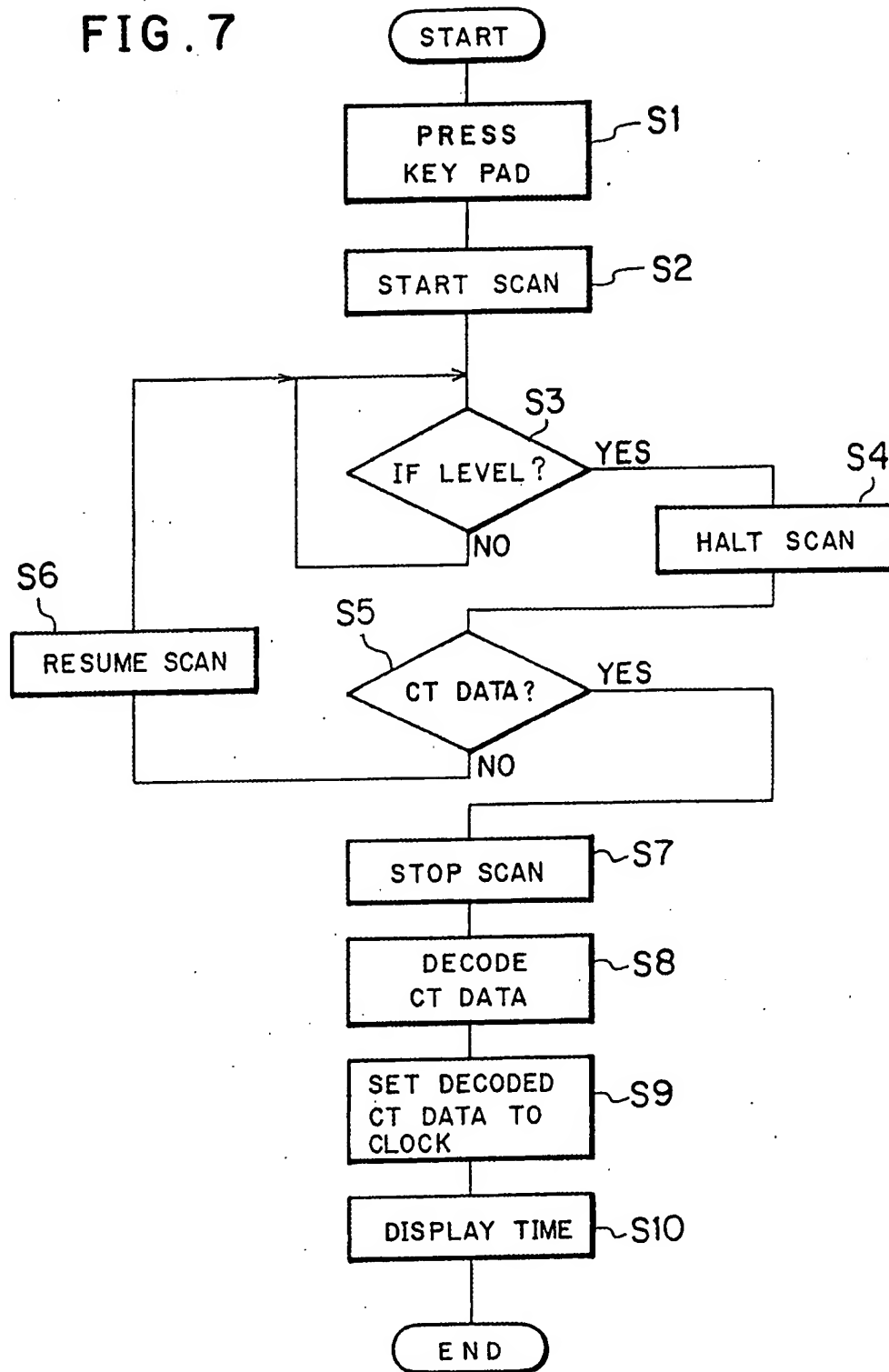
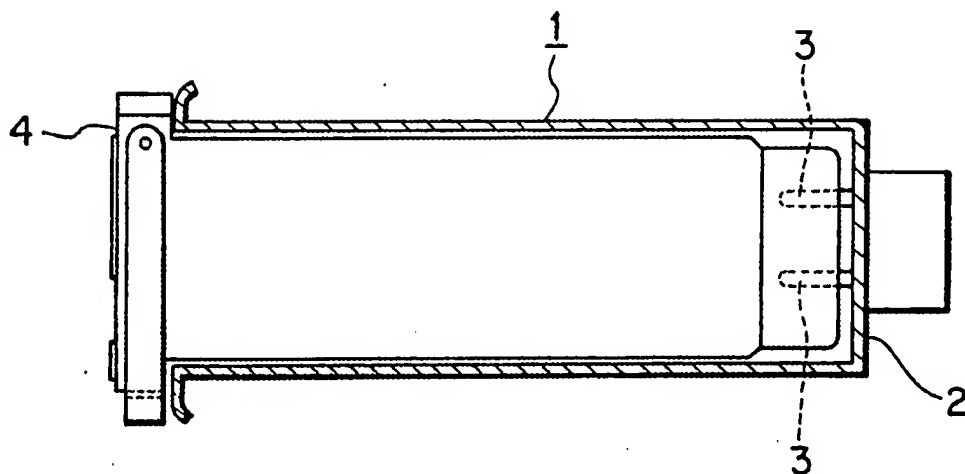


FIG. 8



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RADIO DATA SYSTEM RECEIVER

BACKGROUND OF THE INVENTION

Field of Invention

The present invention relates to an radio data system receiver, and more particularly to an radio data system receiver in which a time data in the radio data system broadcast is used so as to display the current time.

Prior Art

The radio data system broadcast (referred to as RDS) has been proposed in which the information associated with the program currently on the air is multiplexed with a main signal and is demodulated at the receiving end so as to provide the radio listeners with these information. The radio data system has been put in practical use in Europe. In the radio data system, a bi-phase coded data signal is FSK-modulated onto a subcarrier of 57 kHz, which is three times that of the pilot tone (19 kHz) in the FM stereo broadcast. The data signal in the radio data system broadcast is formed of four blocks each of which includes 26 bits of information. One of the four blocks contains the CT signal indicative of time therein which is outputted, for example, every minute.

This type of on-vehicle receivers are often stolen, for example, at night while the driver is away from his car for a long time. For this reason, the receiver is usually loaded into a quick release mechanism which enables the user

to draw the receiver out of the supporting bracket to carry around where he goes when he leaves the car. The quick release mechanism has a bracket box 1, made of a sheet of metal formed into a shape of a rectangular cylinder as shown in Fig. 8 for detachably holding an RDS receiver therein, and is mounted by means of screws or the like in a convenient space within the passenger space of the car. The bracket box 1 has a plurality of pins 3 extending thereinto by which the receiver is supplied its electric power thereto.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an RDS receiver in which the receiver and displays time information based on the CT data. Another object of the invention is to provide an RDS receiver which has a built-in clock for displaying time information when the receiver is used in an area where no CT data is broadcasted or when the proper reception of CT signal is interfered. Still another object of the invention is to provide an RDS receiver which has a built-in clock that is corrected by the CT data so that the clock keeps as accurate time as the CT data. Yet another object of the invention is to provide an RDS receiver which has a quick release mechanism and a built-in clock for displaying time information which is automatically set a new accurate current time based on the CT data when the receiver is returned into the release mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

Features and other objects of the invention will be more apparent from the description of the preferred embodiments with respect to the accompanying drawings in which:

Fig. 1 is a block diagram showing an embodiment of an RDS receiver according to the present invention;

Figs. 2-7 is flowcharts of embodiments of the operation of the present invention; and

Fig. 8 is a cross-sectional side view showing a quick release mechanism.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiment

An embodiment of the present invention will now be described with respect to Fig. 1. An RF signal received through an antenna 10 is directed to an RF amplifier 11 for amplification. The amplified RF signal is then mixed with a local oscillator frequency from a local frequency oscillator 13 by a mixer 12 to be converted into an IF signal. The local frequency oscillator 13 is a PLL type oscillator which is controllably varied its frequency in accordance with a scan signal from a control circuit 19 that takes a form of a microcomputer. The IF signal is amplified by an IF amplifier 15 and is then fed to an FM detector 16 for FM demodulation. The IF amplifier 15 also

outputs a signal indicative of the strength of the IF signal onto a signal line 23 through which the control circuit 19 receives the signal. The demodulated output from the FM detector 16 is supplied to an MPX circuit 17 is separated into an R out and L out audio signals. The output of the FM detector is also supplied to a data decoder 18 so as to extract the CT data together with other RDS data. The CT data from the data decoder 18 is supplied to the control circuit 19. The RF amplifier 11, mixer 12, local frequency oscillator 13, IF amplifier 15, and FM detector 16, all together form a tuner 14.

A key pad 20 is connected to the control circuit 19 and sends out a station-selection command for selecting RDS broadcast stations to the control circuit 19 via input port 19b. The CPU 19c outputs a scan signal to the local frequency oscillator 13 via the tuning control line 24 in response to the station-selection command supplied thereto. The control circuit 19 incorporates a clock 19d provided with associated circuits (not shown), which properly divides down the frequency of pulses from an oscillator 22 to provide appropriate time information to be displayed on a displayer 21. In this manner, the clock 19d is incremented, for example every second, by a pulse CLK produced on the basis of the pulses from the oscillator 22. The CPU 19c outputs the time information TIME from the clock 19d to a displayer 21 via an output port 19a. By this built-in clock 19d, the user can tell time even when he goes to a district where no

CT data is broadcasted. The initial setting of time of the clock 19d may be performed externally by the use of the key pad 20. When the CT signal is being received, the CPU 19c decodes the CT data so as to correct the time information of the clock 19d in response to the clock signal CLK, so that the displayer 21 displays a new accurate time information thereon. The clock 19d is adapted to time in increments of seconds but is not as accurate as the CT data which is usually updated every minute, and therefore the clock 19d may result in an error of a few minutes in a month if it is to run without correction. However, this error can be corrected out in the present invention by correcting the clock 19d, for example every minutes, with the CT data as mentioned above. Thus, accurate time information is always displayed on the displayer 21. The decoded CT may be directly supplied to the displayer for time display. The microcomputer 19 is provided with a built-in backup power source (not shown). Alternatively, if the receiver is to be returned to the quick release mechanism within a day or so, by-pass capacitors on the power line are enough to maintain the data stored in the memory (not shown) since the microcomputer actually draws only a small amount of current. In which case, the circuits connection of the by-pass capacitors are properly arranged by, for example reverse-current protecting diodes, to prevent current from being drawn by circuits other than the microcomputer.

Operation

The operation of the invention when the receiver is drawn out from the quick release mechanism will be described with reference to the flowchart in Fig. 2. The user first operates the key pad 20 to stop the operation of the receiver. The control circuit 19 outputs a scan signal to the local frequency oscillator 13 via the tuning control line 24 (step 1). The control circuit 19 detects the IF level based on the signal outputted onto the signal line 23. If a required level of IF signal is detected (step 2), then the scanning is halted (step 3). Then, a decision is made based on whether the CT data is supplied from the data decoder 18 (step 4). If the CT data exists at step 4, the scanning operation is stopped (step 6) and then the receiving frequency of the station is stored into the control circuit 19 as well as the receiver is turned off. Through the steps mentioned above, the frequency of the CT-data-broadcasting station which can be received with good sensitivity is stored. The user now draws the receiver out of the bracket and carries it wherever he goes.

The operation of the invention when the receiver is returned into the quick release mechanism will be described with reference to the flowchart in Fig. 3. When the user inserts the receiver into the quick release mechanism and turns on the receiver, the program detects it (step 1). The program reads the receiving frequency stored at step 7 in

Fig. 1 (step 2) so as to receive that station. Then, a decision is made based on whether the received station is broadcasting the CT data (step 3). If the CT data is received at step 3, the control circuit decodes the CT data (step 4) to produce the time information and outputs the information to the displayer 21 upon the clock signal CLK.

While the embodiment described in detail has been constructed so that the station stored at step 7 in Fig. 2 is automatically received, the receiver may be modified as shown in Fig. 7 such that the scan operation is performed so as to search for a station broadcasting the CT data in response to a press of a certain key on the key pad 20 when a non-RDS station is being tuned.

The RDS receiver may be modified as shown in Fig. 4 so that the clock 19d is incremented by the clock signal CLK to continue the display of time information after the properly received last CT data. The RDS receiver may also be modified as shown in Fig. 5 so that the clock 19d is corrected by the decoded CT data and thereafter the CPU outputs time information TIME from the clock 19d to the displayer 21. The RDS receiver may be modified as shown in Fig. 6 such that if the CT data is lost during the reception of the RDS station, the scan operation is performed to search another station broadcasting the CT data.

Claims:

1. A radio data system receiver for receiving a broadcasting wave onto which a time-indicating signal (CT) is multiplex-modulated with a main signal, comprising:
 - a tuner means (14) for receiving and demodulating said broadcasting wave to output a demodulated signal including said main signal and said time-indicating signal;
 - a decoding means (18) for decoding said demodulated signal to extract said time-indicating signal;
 - a control means (19) for outputting a current time information (TIME) produced on the basis of said time-indicating signal; and
 - a displaying means (21) for displaying said current time information.
2. A radio data system receiver according to Claim 1, wherein said control means decodes said time-indicating signal to produce therefrom said current time information.
3. A radio data system receiver according to Claim 1, wherein said control unit further includes a clock (19d) for generating said current time information, said current time information of said clock being corrected by said time-indicating signal so that said current time information is as accurate as said time-indicating signal.
4. A radio data system receiver according to Claim 3,

wherein said control means outputs a scan signal to said tuner means when said tuner means fails to properly receive the station broadcasting said time-indicating signal, and said tuner means searches for another station which is broadcasting the time-indicating signal.

5. A radio data system receiver according to Claim 3, wherein said control means outputs a scan signal to said tuner means when said control means is activated externally, and said tuner means searches for a station which is broadcasting the time-indicating signal.

6. A radio data system receiver according to Claim 3, wherein said control means records the frequency of the station broadcasting said time-indicating signal when said control means is activated externally, and said tuner receives and demodulates said recorded broadcasting wave to output a demodulated signal including said time-indicating signal when said receiver is turned on again so that said current time information of said clock is automatically corrected by said time-indicating signal.